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ABSTRACT

This study compared two methods of computer instruction for older adults. Elder Computer Instruction was systematically designed and developed according to criteria established by both theory and research in andragogy. This instructional design took into consideration identified cognitive and physical changes that accompany the aging process. Traditional Computer Instruction consisted of generic computer instruction commonly used with adults of all ages. A checklist, the Criteria Checklist for Andragogical Principles, was developed to help instructional designers and educators assess the adherence of instructional materials to andragogical principles. The systematic process for instructional design detailed in the study should be of use to those involved in the design, development, and delivery of instruction for older adults. The study investigated the effects of both types of instruction on older adults' computer attitudes, frequency of computer use, and types of computer tasks performed. Participants in both groups completed the Attitudes Toward Computers Questionnaire that assessed six dimensions of attitudes toward computers. Participants receiving Elder Computer Instruction had significantly more positive attitudes in the dimensions of efficacy, interest, and utility. The Computer Task Frequency Survey was given as a pretest-posttest. Both groups increased in their frequency of computer use and types of computer tasks performed following instruction. There was a significant difference between the two groups in the e-mail task, with those who received Elder Computer Instruction sending more e-mail than those who received Traditional Computer Instruction. This study underlines the importance of designing instruction to meet the specialized learning needs of older adults. (Contains 28 references.) (Author/AEF)

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Older Adults Eager to Explore Cyberspace

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Abstract

This study compared two methods of computer instruction for older adults. Elder Computer Instruction was systematically designed and developed according to criteria established by both theory and research in andragogy. This instructional design took into consideration identified cognitive and physical changes that accompany the aging process. Traditional Computer Instruction consisted of generic computer instruction commonly used with adults of all ages. A checklist, the Criteria Checklist for Andragogical Principles, was developed to help instructional designers and educators assess the adherence of instructional materials to andragogical principles. The systematic process for instructional design detailed in the study should be of use to those involved in the design, development, and delivery of instruction for older adults. The study investigated the effects of both types of instruction on older adults' computer attitudes, frequency of computer use, and types of computer tasks performed. Participants in both groups completed the Attitudes Toward Computers Questionnaire that assessed six dimensions of attitudes toward computers. Participants receiving Elder Computer Instruction had significantly more positive attitudes in the dimensions of efficacy, interest, and utility. The Computer Task Frequency Survey was given as a pretest/posttest. Both groups increased in their frequency of computer use and types of computer tasks performed following instruction. There was a significant difference between the two groups in the e-mail task, with those who received Elder Computer Instruction sending more e-mail than those who received Traditional Computer Instruction. This study underlines the importance of designing instruction to meet the specialized learning needs of older adults.

Older Adults Eager to Explore Cyberspace

As people age, once-active adults often find their world gradually shrinking as they become less mobile due to physical impairments that affect walking and driving (Coughlin, 1999). The Internet, however, offers older adults new opportunities for communication and car-less access to religious services, cultural activities, and educational opportunities (Whelen, 1998). According to Czaja and Sharit (1998), if older adults are successful in acquiring basic computer skills, they will realize that their daily lives can be enhanced and enlivened by using technology. Because most older adults did not learn to use computers in school (Dunnett, 1998), or in the workplace, those who now want to use them must find sources for instruction.

Computer use among older adults is increasing rapidly. According to the U. S. Census Bureau (2000), 27.6% of adults over the age of 55 live in a home with Internet access. A survey by International Data Corporation reports that adults over the age of 55 account for more than 12 million Internet users, an increase of 106% over users in the same age group in 1999. By 2004, this age group is expected to comprise 20% of all new Internet users (Hoffman, 2000).

Although computers are becoming less expensive and easier to use, older adults still face the problem of acquiring basic computer skills. Morrell, Mayhorn, and Bennett (2000) surveyed 115 Web users and 266 Web nonusers between the ages of 40-92. More than 81% of the Web users reported that they had taught themselves to use the Web. The two primary reasons given by the nonusers for not using the Web were the lack of computer access and lack of knowledge about using the Web. Both groups indicated that they would like to have simple instructional materials to show them how to use the different features of the Web. Morrell and Echt (1997) point out that older adults who are interested in learning about computers often have to search for training opportunities or have to teach themselves to use computers. The instructional materials they use are often designed for much younger people.

Research indicates that adults learn best when the learning goal is articulated clearly and when they can apply their learning to real-life problems (Redding, Eisenman, & Rugolo, 1998). The necessity for taking into account the learner's readiness to learn, life experiences, self-direction, intrinsic motivation, and problem-solving ability, as well as the immediate value to the learner, forms the basis of the adult learning theory known as andragogy. One of the strengths of this theory is its adaptability to the uniqueness of learners and to various learning situations. Because the principles of andragogy can be applied to a variety of adult learning situations (Knowles, Holton, & Swanson, 1998), it is an ideal conceptual framework on which to base computer instruction.

The practice of teaching adults could be said to have begun with philosophers and religious leaders such as Confucius, Socrates, Plato, and Jesus. It was not, however, until the second half of the twentieth century that Malcolm Knowles integrated various adult teaching methods into an adult learning theory that is now called andragogy. Knowles (1990) found that andragogy was especially pertinent to computer instruction. He points out four characteristics of adult learners that should inform the design of computer instruction for adults. First, because adults have a deep need to know why they should learn something before they invest their time and energy, computer instructors should explain the purpose of specific computer functions. Next, instructors should start with adult learners' interests because adults learn best those things that they must know in order to perform tasks that are relevant to them. Instructors should ask learners to write their personal goal for computer use. Third, the instructor should find out the background experiences of the learners in order to give them choices based on their prior experiences. Instructors

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should administer a pretest survey to determine the computer tasks the learners have performed prior to the instruction. Finally, adults are self-directing and dislike having decisions imposed on them. For this reason, teachers should allow adults to figure things out for themselves. Teachers who become facilitators rather than directors of learning create a nurturing learning environment.

Researchers such as Czaja and Sharit (1998) and Jay and Willis (1992) found that experience with computers increases older adults' feelings of comfort with technology, competence with computers, and feelings that computers are useful. Redding, Eisenman, and Rugolo (1998) note that adults learn best when the learning goal is articulated clearly and when they can apply their learning to real-life problems.

In addition to the characteristics of the individual adult learner, the effects of group experience are also relevant. Because learning is a social practice (Knights, 1993), the communal dimension of learning should not be undervalued. Knights points out that groups can exert a powerful influence to advance learning. Dixon and Gould (1996) found that when older adults collaborated with others in a problem-solving situation, their cognitive performance was enhanced. According to Cahoon (1996), when members of a group learn computer skills together, they can share their skills and knowledge as they solve computer problems through informal interactions with other group members.

Statement of the Problem

As America's population ages, it has become increasingly important that older adults have access to computer instruction that will enable them to feel more included in our technological society (Morris, 1994). Furthermore, computer instruction should be designed specifically to meet their needs. This study focused on the need to design instructional materials and to develop both instructional and grouping strategies that were theoretically grounded in the principles of andragogy. This instruction took into consideration identified cognitive and physical changes associated with aging. These changes include changes in vision, hearing loss (White et al., 1999), and decline in working memory, which is the process of storing information that is necessary in order to perform certain cognitive tasks (Salthouse & Babcock, 1991).

Purpose of the Study

This study focused on the systematic design, development, implementation, and evaluation of instruction to address the needs of older adults. The purpose of this study was to compare two methods of computer instruction for older adults. The study investigated the effects of both types of instruction on older adults' computer attitudes, frequency of computer use, and types of computer tasks performed. In addition, the study considered the effects of grouping on the computer attitudes of older adults.

Elder Computer Instruction

A needs assessment was conducted among a representative group of 54 older adults (Lawton, 1999). The results indicated that this population perceived themselves to have the greatest performance discrepancy with regard to computer competencies when they compared themselves to other age groups. Next, computer instruction for older adults was designed. The instructional materials were tested in a field trial and then refined and revised based on feedback from participants in a posttest survey and a focus group.

Elder Computer Instruction was systematically designed computer instruction. It was based on criteria established from both theory and research in andragogy and cognition and was developed using a process called instructional systems design. According to Seels and Richey (1994), instructional systems design is an organized procedure that includes the steps of analyzing, designing, developing, implementing and evaluating instruction. Analyzing is the process of defining what is to be learned; developing is the process of authoring and producing the instructional materials; implementing is actually using the materials and strategies in context, and evaluating is the process of determining the adequacy of the instruction. The Dick and Carey (1996) model was chosen as the instructional design framework because it provides a strong, fundamental process of instructional design that incorporates learning theory research and practical application. The strength of this model, which provides a step-by-step process to design instruction, is that all design components work together systematically to produce effective instruction and evaluation. The components of a learning system are made up of the learners, the instructor, the instructional materials, and the learning environment. The focus of a systematic instructional design is on what the learner is to know at the conclusion of the instruction (Dick & Carey). Design decisions based on data are particularly important in this model, thus the emphasis on needs assessment, formative evaluation and field trials.

Traditional Computer Instruction

Traditional Computer Instruction is generic computer instruction commonly used with adults of all ages. It was not specifically designed for older adults. Lectures were used to teach the history of computers, the purposes of computer systems, the functions of computer hardware, the importance of a comfortable working environment, and the use of computer terminology. Hands-on activities, beginning with lower level skills, were used. Activities were modeled, but in some instances learners were not given time to practice the activity. The computer manual contained the same information as the lecture and was uniform for all adult age groups. Most of the instructions were given orally. No memory aids in the form of written step-by-step directions were provided. Learners were instructed to use the "help" function on the task bar if they forgot a computer application.

The two instructional methods compared in this study shared the same terminal goal, that of enabling older adults to develop basic computer skills. The differences in both the instructional content and the teaching strategies in the two methods, however, were considerable.

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Methodology

A quasi-experimental design was chosen as the framework for this empirical study. According to Huck and Cormier (1996), the most frequently used quasi-experimental design is the nonequivalent control group design. The group using Elder Computer Instruction was the treatment group; the group using Traditional Computer Instruction served as the comparison (control group). This study utilized the nonequivalent control group design because of the availability of pretest data and the fact that participants were not randomly assigned to the comparison group.

Instructional Environment

The six computer workshops for the treatment group (Elder Computer Instruction) were held in the same computer lab located in the Educational Technology Training Center at a local university. Each workshop was conducted on a Saturday from 9:00 a.m. until 3:00 p.m. with an hour for lunch. In addition, a morning and an afternoon break were included in the schedule. Participants were encouraged to take any extra breaks that were necessary. Every effort was made to ensure that participants were comfortable. In addition to the instructor, at least two facilitators were present in each workshop to provide individual instruction and to answer participants' questions. Participants were encouraged to ask questions at any time during the instruction. The lab was well lighted with adequate space and was furnished with adjustable chairs on rollers. Although the 17 computers in the lab were located in close proximity, there was enough space at each workstation for participants to work comfortably. Computers were networked to one printer and equipped with Windows 2000. All computers had Internet access. The lab also contained a teaching station and a smart-board projection system. Each participant was provided with a computer manual and a diskette.

The comparison group (Traditional Computer Instruction) attended computer classes held in a computer lab at a local technical college. The class met for two hours on Tuesdays and Thursdays for two weeks. Total instructional time was eight hours. The computer lab at the technical college was spacious and well lighted. The 18 computers in the lab were located on wide tables, and the adjustable chairs were equipped with rollers. A white board at the front of the room was provided for the instructor's use. The lab contained a teaching computer that could be projected onto the screen at the front of the room. The computers were networked to one printer and equipped with Windows 2000. The computers did not have Internet access. The instructor provided both group and individual assistance, as there were no facilitators to assist in the instruction. Each participant was provided with a computer manual and a diskette.

Participants

The 93 participants in this study consisted of older adults who ranged in age from 55 to 85 years of age with a mean age of 68.4 years. There were 25 males and 68 females. Participants were divided into three groups: an existing group, a newly formed group, and a comparison group. Thirty-seven participants were volunteers who were members of three different existing groups. Two groups were from area churches, and one group consisted of a sorority for professional women. This group consisted of 9 males and 28 females with a mean age of 69.1 years. Twenty-seven were Caucasian and 10 were African-American. These participants were previously acquainted and shared commonalities.

There were 45 participants in the newly formed groups. They were acquainted with few, if any of the other participants prior to the computer workshop. These participants were recruited from advertisements in the newspaper, fliers in area grocery stores, advertisements in senior centers, advertisements at a local hospital that provides senior activities, and word-of-mouth referrals. This group consisted of 12 males and 33 females with a mean age of 67.8 years. Thirty-five were Caucasian and 10 were African-American.

The participants in the comparison group began with four males and eight females. One female dropped out after the second session. The remaining participants had a mean age of 68.6 years. All were Caucasian. These participants were enrolled in a basic computer class through a continuing education program at a local technical college. All volunteered to take part in the study. The number of participants was determined by course registration with the intent to compare groups of approximately equal size.

Instructional materials designed for this study were compiled in a computer manual entitled Seniors Surf Into the Twenty-first Century. These materials, first used in a field trial, were developed following the model in The Systematic Design of Instruction (Dick & Carey, 1996). This development process included formative and summative evaluation that was used to revise the instructional materials, making them more efficient and effective. A checklist, the Criteria Checklist for Andragogical Principles (Lawton, 2001), was also designed to assess the adherence of instructional materials to the principles of andragogy (Caffarella, 1993; Cross, 1981; Knowles et al., 1998; Pratt, 1993). This yes/no checklist asks evaluators to assess three major components of instructional design: instructional strategies, design of instructional materials, and design of the physical learning environment. Evaluators then cite evidence and/or concerns for the application of each principle in the space provided on the checklist.

Data Collection

Quantitative data for this study were collected in the following ways. At the beginning of the instruction,participants for both the treatment group and the comparison group were given the Background Demographic Survey. Learners were given the Computer Task Frequency Survey (Lawton, 2001) as a pretest/posttest to determine differences in computer frequency and types of tasks performed between the groups. Although there were differences in the administration of the pretest (which was print) and the posttest done via phone eight weeks following the instruction, the administration was the same for both the treatment group and the comparison group. Participants in both the treatment group and the comparison group completed the Attitudes Toward Computers Questionnaire (ATCQ; Jay & Willis, 1992). This 33-item multidimensional measure assesses six dimensions of

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attitudes toward computers: comfort, efficacy, control, dehumanization, interest, and utility. Each of these dimensions is assessed by five or six items on a 5-point Likert scale format. A seventh dimension, gender equality, was not used in the present study. Response options range from "strongly disagree" to "strongly agree." The ATCQ has been used in prior research with older adults (Czaja & Sharit, 1998; Jay & Willis, 1992).

Data Analysis

Data gathered through the Computer Task Frequency Survey and the Attitudes Toward Computers Questionnaire were analyzed by a one-way analysis of variance. The purpose of the analysis was to determine whether or not there were significant differences at the $p \leq .05$ level in attitudes toward computers and types and frequency of computer tasks performed between the treatment and comparison groups.

Significant differences were found between the treatment group and the comparison group with the treatment group performing higher on three of the six dimensions: efficacy, interest, and utility. In the dimension efficacy, differences were statistically significant, $F(1,92) = 6.204$, $p = .015$. Analysis of the interest dimension revealed a statistically significant difference, $F(1,92) = 7.904$, $p = .006$. The dimension utility also had a statistically significant difference, $F(1,92) = 5.534$, $p = .021$. Analysis of the dimensions of comfort, control, and dehumanization did not reveal a statistically significant difference between the two groups.

When the attitudes of the participants in the existing groups and the newly formed groups (both of these groups received Elder Computer Instruction) were compared, there were no significant differences found. A comparison of the computer attitude of participants receiving Elder Computer Instruction according to age--the young-olds (ages 55-64) and the older-olds (65+)--revealed no significant differences in attitudes.

Two questions measured the frequency of computer use. Participants were asked how many times they had used a computer for any reason and how many hours per week they used a computer. While each group increased their frequency of use from the pretest to the posttest, the differences between the two instructional groups were not statistically significant.

The other nine questions measured the different types of computer tasks participants performed: using the mouse, changing the speed or size of the mouse pointer, moving desktop icons, playing solitaire, saving a document to a disk, sending e-mail, opening e-mail, sending an e-mail attachment, and using the Internet.

Analysis of the e-mail computer task revealed a statistically significant difference, $F(1,92) = 6.067$, $p = .016$, between the treatment group and the comparison group. Participants in the treatment group sent e-mail more frequently than did those in the comparison group. There was no statistically significant difference between the two groups in the other types of computer tasks performed.

Discussion

Results of data analysis support the benefits of systematically designed computer instruction for older adults. The findings indicate that the treatment group receiving Elder Computer Instruction demonstrated more positive attitudes on every attitude dimension than did those receiving Traditional Computer Instruction. In three of the six attitude dimensions, there were significant differences between the two groups. These three dimensions--efficacy, interest, and utility--have a direct relationship to the theory of andragogy. The participants receiving Elder Computer Instruction evidenced a significantly more positive attitude in the area of efficacy. According to the theory of andragogy, adults learn best when they are motivated to learn. They believe that they can learn new material (Knowles, et al., 1998). Elder Computer Instruction participants also evidenced significantly more positive attitudes in the area of interest. Another adult learning principle (Knowles,1990) is that adults are interested in learning what they need to know to perform a task. Finally, data analysis revealed a significantly more positive attitude in the dimension utility for participants receiving Elder Computer Instruction. The core principle of andragogy is that adults need to know why they should learn something before they engage in learning (Knowles et al., 1998). When adults realize how computers can enrich and enliven their lives, they will understand the usefulness of learning computer skills. The participants receiving Elder Computer Instruction appeared to have a greater appreciation of the usefulness of computers.

Conclusions

The distinguishing feature of this study is its focus on the importance and benefits of systematically designing computer instruction for older adults. The statistically significant differences found in attitudes were between the groups receiving different instruction. Neither group membership nor age appeared to have an effect on computer attitudes. The type of instructional method received by the participants appears to be a more important factor in shaping computer attitudes. It was observed during the instruction that members of newly formed groups receiving Elder Computer Instruction evidenced interaction and collaboration with other participants similar to that observed in the existing groups who were previously acquainted. Many participants who were not previously acquainted worked together to perform computer tasks. Participants who learned tasks quickly often checked to be sure that slower participants kept up with the instruction. During the e-mail activity, many exchanged e-mail addresses and e-mailed each other. New acquaintances chatted with each other during breaks and often went to lunch together. With the exception of two married couples, participants receiving Traditional Computer Instruction were not previously acquainted. These participants also worked together to perform computer tasks, helped each other with tasks, and became acquainted with each other during the instruction.

Knights (1993) notes that learning is a social practice, and group members often are concerned for each other. Findings suggest that older adults appear to be more aware of the advantages of collaboration and are often more willing to interact with

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others for assistance or support in learning a task than are younger learners (Dixon & Gould, 1996; Kazemek, 1997). It may be that when older adults have a shared sense of purpose such as learning computer skills, previous group affiliation becomes less important. Prior research also indicates that older adults often feel at a disadvantage when learning computer skills in a fast-paced class with younger learners (Dunnett, 1998; Redding et al., 1998; Timmerman, 1998). Both Elder Computer Instruction and Traditional Computer Instruction were limited to adults, ages 55 and above. Adults in both existing groups and newly formed groups expressed that they preferred computer classes made up of older adults.

This study describes the step-by-step process used to design instructional materials according to learning theory research and practical application. The research also provides new information regarding the relationship between the instructional materials used for older adults and their resulting attitudes toward computer use. When older adults receive computer instruction that is designed uniquely for their needs, they appear to develop more positive attitudes toward computers.

At the conclusion of one of the workshops in which the participants were members of an existing group, one participant confessed that she had once walked out of a computer workshop. "The instructor gave a detailed lecture on the inner workings of the computer. I went to the workshop to learn how to use the computer. I really did not care how it worked, so I left. I stayed for this entire workshop because it was practical. Now I believe that I can use a computer."

JoAnn, another participant, came to the workshop to learn to e-mail. She had traveled in China and discovered that she could have e-mailed her family from public computers at a nominal cost had she known how to set up a hotmail account. After the workshop, she traveled in Europe. She reported that not only had she used the hotmail account that she learned to set up during the class, she had taken her computer manual with her and taught a fellow traveler how to use e-mail.

Monira, originally from Lebanon, owned a computer prior to the workshop and regularly exchanged e-mail with her family in Lebanon. However, she had to wait for a relative or friend to come to her house and open her e-mail so that she could read it, and then send her responses for her. At the workshop, she learned to e-mail independently.

Loretta, another participant, told about her experiences in teaching English to a woman who had recently moved to the United States from South America. In addition to learning English, the woman wanted to learn basic computer skills in order to e-mail her family in South America. Loretta gave her a copy of the manual used in the workshop. Because it was written clearly and simply, a person with limited English could use it successfully.

One of the basic principles of andragogy is that adults learn best those things that they must know in order to perform tasks that are relevant to them (Knowles, 1990). At the beginning of one work shop, an 80-year-old participant confided that her grandchildren had asked, "Grandma, what's wrong with you? You can't e-mail." On the posttest survey eight weeks after the instruction, she reported that she was now e-mailing her grandchildren.

Since this study was the first to compare systematically designed computer instruction for older adults with more generic computer instruction commonly used with older adults, it provides ample opportunity for further research. There are still many older adults who need access to training facilities (Galusha, 1998). All interested older adults need the opportunity to explore the world afforded them by technology --not the least to facilitate those e-mails to their grandchildren.

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